SECTION 16740

TELECOMMUNICATIONS SYSTEMS

PART 1 GENERAL

**********
**Edit 1.1 to match Project requirements.**
**********

1.1 SECTION INCLUDES

A. Furnish and install telecommunications service entrance conduits.

**********
**Use either B or C. Coordinate with LANL CIC-4.**
**********

B. Furnish and install telecommunications terminal boards for LANL supplied cross-connect equipment.

C. Furnish and install telecommunications terminal cabinets for LANL supplied cross-connect equipment.

D. Furnish and install interior conduit system for backbone and horizontal cables.

E. Install and terminate LANL supplied Category 5 UTP horizontal cables.

F. Install LANL supplied telecommunications outlet/connectors.

**********
**Edit 1.2 to match Project requirements. Coordinate with LANL CIC-4.**
**********

1.2 LANL FURNISHED EQUIPMENT FOR CONTRACTOR INSTALLATION (GFE)

A. LANL will furnish the Category 5 UTP horizontal cable required to connect telecommunications outlets.

B. LANL will furnish telecommunications outlet/connectors.

1.3 LANL FURNISHED AND INSTALLED EQUIPMENT

A. LANL will furnish and install telecommunications entrance cable and backbone cable.

B. LANL will furnish and install cross-connect equipment.

C. LANL will furnish and install telecommunications systems electronics equipment.

1.4 LANL PERFORMED WORK

A. LANL will acceptance test installed and terminated Category 5 UTP horizontal cables. Refer to paragraph 3.9.

1.5 DEFINITIONS

A. *Entrance cable* connects the outside service facility to the premise cabling.

B. *Backbone cabling* provides the interconnection between the horizontal cross-connect in

the telecommunications rooms and the entrance cabling.

C. *Horizontal cabling* extends from the telecommunications outlet/connector in the work area to the horizontal cross-connect in the telecommunications room.

D. *Cross connect* equipment enables the mechanical termination and interconnection of premise cabling.

E. *Telecommunications* means either telephone or data or both.

**********
**Edit 1.5 to match Project requirements.**
**********

1.6 SUBMITTALS

A. Provide the following submittals according to the requirements of Section 01300.

Within 30 days after Notice to Proceed, submit certifications of the qualifications of the Category 5 UTP horizontal cable installer as described in Paragraph 1.5 of this Section.

1.7 QUALITY ASSURANCE

A. Conform to the requirements of ANSI/NFPA 70, *National Electrical Code*.

B. Conform to the requirements of the following telecommunications standards:

1. ANSI/TIA/EIA-568-A, *Commercial Building Telecommunications Cabling Standard*.

2. ANSI/EIA/TIA-569, *Commercial Building Standard for Telecommunications Pathways and Spaces*.

3. ANSI/EIA/TIA-606, *Administrative Standard for the Telecommunications Infrastructure of Commercial Buildings*.

4. ANSI/TIA/EIA-607, *Commercial Building Grounding and Bonding Requirements for Telecommunications*.

5. TIA/EIA TSB-67, *Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems*.

C. Qualifications of the Category 5 UTP cable installers:

1. Certificate of training from a recognized manufacturer or distributor of Category 5 unshielded twisted pair (UTP) cable stating that the individual is trained to install and terminate Category 5 UTP cable.

2. Recognized manufacturers, distributors, and industry certifiers include: Anixter, Belden, Krone, Lucent, and BICSI.

1.6 COORDINATION

A. Coordinate training and cable termination tool requirements for horizontal cabling installers with the LANL CIC-4 group.

B. Schedule completion of the telecommunications rooms to allow not less than 5 working days for the LANL CIC-4 group to install cross-connect equipment before the scheduled start of cable installation. Coordinate schedule with the LANL CIC-4 group.

C. Order horizontal cabling and outlet/connectors from the LANL CIC-4 group based on actual count, measurement of conduit and cable tray runs and required slack cable. Place order not less than 10 working days prior to scheduled start of cable installation.

D. Schedule installation of horizontal cabling and outlet/connectors to start after the completion of application of finishes to walls to minimize potential damage to cables.

PART 2 PRODUCTS

2.1 CONDUIT

Refer to Section 16111 - “Conduit”.

**********

**Edit 2.2 to match Project requirements; delete if power and communications surface metal raceway is not used.**

**********

2.2 POWER AND COMMUNICATIONS SURFACE METAL RACEWAY

Refer to Section 16112 -- “Surface Metal Raceway”.

**********

**Edit 2.3 to match Project requirements; delete if cable tray is not used.**

**********

2.3 CABLE TRAY

Refer to Section 16114 -- “Cable Tray”

2.4 OUTLET BOXES

Refer to Section 16130 - “Boxes”.

2.5 PULL AND JUNCTION BOXES

Refer to Section 16130 - “Boxes”.

**********

**Use either 2.6 or 2.7; coordinate with LANL CIC-4.**

**********

2.6 TERMINAL BOARDS

A. Use 3/4 inch thick APA grade A-B interior plywood.

B. Paint with two coats of white or light grey, intumescent latex, fire-retardant paint with a Class A fire rating. Manufacturer: Benjamin Moore “Retardo Latex Fire Retardant Paint.”

**********

**Use either 2.6 or 2.7; coordinate with LANL CIC-4.**

**********

2.7 TERMINAL CABINETS

A. Provide cabinets that meet the requirements of UL50 -- *Enclosures for Electrical Equipment*. Provide NEMA 1 or NEMA 3R cabinets as indicated on the Drawings.

B. Provide galvanized steel cabinets with minimum dimensions of 24 inches wide, 35 inches high, and 6 inches deep; provide larger cabinets as indicated on the Drawings.

C. For each cabinet provide grey baked enamel finished steel front with hinged door having a hasp and staple for padlocking. Provide fronts designed for surface or flush mounting as indicated on the Drawings.

D. Provide 3/4 inch thick plywood backing in each cabinet.

E. Manufacturer: Square D “Class 6650"

2.8 GROUNDING

A. Provide a ground bar for each terminal board and cabinet.

1. Furnish 12 inch x 1 inch x 1/4 inch copper ground bar with 1 inch standoff insulators.

2. Drill ground bar with eight 0.25 inch holes at 1.25 inch spacing.

3. Manufacturers: Cadweld, Harger, Newton Instrument Co.

B. Refer to Section 16450 -- “Secondary Grounding” for additional requirements.

2.9 CATEGORY 5 UTP CABLE - GFE

A. Cable is UL listed as type CMP for use in ducts, plenums and air handling spaces.

B. Cable consists of four No. 24 AWG unshielded twisted pairs; cable outside diameter is less than 0.25 inches.

2.10 OUTLET/CONNECTORS - GFE

A. Each GFE telecommunications outlet will consist of a plastic faceplate with four TIA/EIA-568-A configured RJ45 modular connectors.

B. Cable connections are made to insulation displacing type connectors using an approved punch down tool.

C. Manufacturer: Krone

2.11 CROSS-CONNECT EQUIPMENT - GFE

A. GFE cross connect equipment will consist be 8-pair termination blocks assembled on an interlinking mounting system with provisions for identifying cables.

B. Cable connections are made to insulation displacing type connectors using an approved punch down tool.

C. Manufacturer: Krone “High Band”.

PART 3 EXECUTION

3.1 CONDUIT INSTALLATION

A. Install an individual 1" conduit for telecommunications horizontal cable from each telecommunications outlet to the telecommunications terminal board, telecommunications cabinet, or telecommunications cable tray.

**********
**Edit B to match Project requirements; delete if power and communications surface metal raceway is not used.**
**********

B. For every 4 telecommunications outlets in a power and communications surface metal raceway, install a 1-1/4" conduit from the raceway to the telecommunications terminal board, telecommunications cabinet, or telecommunications cable tray.

C. Install telecommunications conduit in maximum lengths of 150 ft with not more than two 90-degree bends or equivalent redirection between any two adjacent conduit openings. Install pull boxes as required to meet this requirement.

D. Use bends on conduits for horizontal cables with a minimum inner edge radius of 5 inches.

E. Use bends on conduits for entrance and backbone cables with a minimum center line radius of 24 inches.

F. Do not use conduit bodies for changes in direction.

G. Refer to Section 16111 -- “Conduit” for additional installation requirements.

**********
**Edit 3.2 to match Project requirements; delete if power and communications surface metal raceway is not used.**
**********

3.2 POWER AND COMMUNICATIONS SURFACE METAL RACEWAY INSTALLATION

A. Install fittings in the raceway to assure a minimum cable bending radius of 1".

B. Provide special device plates for mounting 3-3/8" x 6" four-port surface mount telecommunications outlet boxes.

C. Install no more than 8 telecommunications outlets per raceway segment. Provide an entrance end fitting punched for 1-1/4" conduit for every 4 outlets.

D. Refer to Section 16112 -- “Surface Metal Raceway” for additional requirements.

3.3 OUTLET BOX INSTALLATION

A. Install telecommunications outlet boxes with centers at the following heights unless noted otherwise on the Drawings:

1. Telecommunications outlets -- center 18 inches above the finished floor.

2. Wall telecommunications outlets -- center 42 inches above the finished floor.

3. Telecommunications outlets at lab benches and counters -- center 44 inches maximum above the finished floor; coordinate locations to be above, or completely within, bench and counter backsplashes.

B. Outlets are shown on the Drawings in approximate locations unless dimensioned. Verify final location of each outlet box by field measurements and coordination with other trades. Install each box at a location suitable to serve its intended purpose.

C. Refer to Section 16130 -- “Boxes” for additional installation requirements.

**********
**Use either 3.3 or 3.4. Coordinate with LANL CIC-4.**
**********

3.4 TERMINAL BOARD INSTALLATION

A. Install pre-painted terminal board lining three walls of each telecommunications room from the floor to 8 ft above the floor.

B. Install terminal boards plumb, and attach securely to the building structure with fasteners at not more than 24" on center vertically and horizontally.

3.5 TERMINAL CABINET INSTALLATION

A. Install terminal cabinets at locations indicated on the drawings.

B. Install terminal cabinets plumb, and attach securely at four points.

C. Install terminal cabinets with top of cabinet trim not more than 6'-2" above finished floor.

**********
**Edit D. to match Project requirements.**
**********

D. At flush mounted cabinets stub four empty 1 inch conduits from the cabinet into accessible ceiling space or space designated to be accessible ceiling space in the future. Stub four empty 1 inch conduits into raised floor space or below slabs other than slabs on grade.

3.6 GROUNDING INSTALLATION

A. Install a ground bar at lower right corner of the left wall terminal board. Connect to the building main electrode ground bar with #4/0 ground cable.

B. Bond telecommunications cable tray to the ground bar with #6 AWG. Install a #6 AWG grounding conductor in the cable tray; bond conductor to each cable tray section using listed cable tray ground clamps.

C. At the terminal board or cabinet, bond all metallic telecommunications raceways to the ground bar per ANSI/TIA/EIA 607. Use approved fittings and minimum No. 12 AWG bonding jumpers to make telecommunications raceways electrically continuous.

D. Refer to Section 16450 -- “Secondary Grounding” for additional installation requirements.

3.7 CROSS CONNECT EQUIPMENT INSTALLATION

A. Cross connect equipment will be furnished and installed by LANL CIC-4.

B. Entrance and backbone cabling will be furnished and installed by LANL CIC-4.

C. Cross connect jumpers will be furnished and installed by LANL CIC-4.

3.8 TELECOMMUNICATIONS CABLE INSTALLATION

A. Handle and install cable according to cable manufacturers’ instructions.

1. Do not subject cable to a bending radius of less than 1 inch.

2. Do not subject cable to more than 32 lb pulling tension.

3. Do not kink or excessively twist cable.

4. Do not skin or damage cable sheath or conductor insulation.

B. Examine raceways to receive cables for compliance with installation tolerances and other conditions. Do not proceed with installation until unsatisfactory conditions have been corrected.

**********

**Edit C to match Project requirements.**

**********

C. Remove existing cable from raceways before pulling in new cable.

D. Completely and thoroughly swab raceways before installing cable.

E. Clean foreign matter from interior of boxes and conduits before installing cables.

F. Store cable for 24 hours in the installation area ambient temperature before installing.

G. Do not “through-pull” cables at boxes, fittings or cabinets where a change of raceway alignment occurs.

H. Comply with Article 800 of NFPA 70.

I. Install 4 LANL furnished Category 5 UTP horizontal cables from each telecommunications outlet to the telecommunications terminal board or the telecommunications cabinet. Leave 15 feet of slack at the cross-connect end and 18 inches of slack at the outlet end.

J. Uniquely identify each cable at both ends using a numbering scheme that complies with ANSI/EIA/TIA-606 and instructions from LANL CIC-4; use a tag or an indelible marker.

K. Terminate horizontal cables on GFE telecommunications outlet/connectors in accordance with ANSI/TIA/EIA-568-A, designation T568B, per figure 10-2, “Optional Eight Position Jack Pin/Pair Assignments”, using an approved punch-down tool. Leave 12 inches of slack in cables. Coil cable into outlet box and install faceplate on outlet box.

L. Terminate horizontal cables on cross connect equipment in accordance with ANSI/TIA/EIA568-A using an approved punch-down tool. Group cable terminations by work station and as directed by LANL CIC-4.

M. After cables are terminated, legibly mark and install GFE designation strips and tags on the telecommunications outlet/connectors and cross connect equipment as directed by LANL CIC-4.

3.9 ACCEPTANCE TESTING

LANL will acceptance test installed and terminated Category 5 horizontal cables in accordance with TIA/EIA TSB-67. Replace cables that do not pass acceptance tests.

END OF SECTION